E/CONF.39/D/179
12 Nov.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: D.3.3

Sudan

SPECIFICATIONS AND STANDARDS

By Osman AHMED TAMAN,
Inspector,
Ministry of Commerce,
Industry and Supply

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SPECIFICATIONS AND STANDARDS

by

Osman Ahmed Taman, Inspector
Ministry of Commerce, Industry and Supply

Broadly speaking industrialization in the Sudan made a serious start only in 1956, after the Independence, when the Government enacted the Approved Enterprises(Concessions) Act, the object of which was to give facilities to industrial and similar undertakings so as to speed the rate of industrialization of the country and attract investment of both local and foreign capital. Thanks to this policy more than 200 projects have so far been classified as Approved Enterprises, and a fair number of these has already been established and has started to supply the local market with various types of goods. These can be classified into the following categories :

a) Building materials:

1- Cement
2- RedBricks.
3- Household and sanitary earthenware
4- Gypsum and whiting
5- Floor tiles
6- Asbestos cement sheets and pipes

b) Chemical Industries:

1- Pharmaceuticals
2- Paints, polishes and varnishes.
3- Toilet and cosmetic preparations
4- Laundry and Toilet soap
5- Laundry blue
6- Detergents
7- Perfumeries.
8- Matches
9- Batteries.

c) Cigarettes and Tobacco:

d) Food Stuffs:

1- Flour milling
2- Macaroni and Vermacelli

3- Canned foods.

4- Alcohols and alcoholic liquors

5- Beer

6- Confectionery

7- Biscuits.

c) Electrical Appliances:

1- Water coolers

2- Air conditioners and desert coolers

3- Refrigerators

f) Household Utensils:

1- Aluminiumware

2- Glassware

3- Plasticware

4- Enamelware

g) Metal Works:

1- Wire nails

2- Office and household steel furniture

h) Edible Oils:

1- Extraction and refining of (sesame, groundnuts, castor and cotton seed oils)

2- Hydrogenated fats and oils for :

a) edible purposes

b) industrial purposes

i) Tanning of Leather:

j) Footwear:

1- Rubber

2- Canvas

3- Plastic

4- Leather

k) Textile:

1- Cotton spinning and weaving

2- Knitwear

3- Mantles

l) Paper and Paperboard:

1- Packing materials

2- Cardboard

3- Hardboard.

Most of these industries at present depend on a high proportion of imported raw materials. The general pattern of industrial development, so far, has been for potential industrialists to rely on foreign plant manufactures to provide efficient and suitable machinery, together with a limited number of technicians (usually machine operators) to start the plant and train local workers so as to take over. The customers, usually businessmen, have little or no technical skill or managerial training, rarely employ consultants and thus depend on the reputation of the suppliers. After the establishment of the industry, the aim of the management is to build up the purely functional side of their business. Suitable technicians are not available in the Sudan at present and foreigners are too costly. Under these circumstances, inspite of the reliefs and concessions provided by the Approved (Concessions) Act, many of the local products are often not of the same quality ~~of the same quality of~~ as the imported articles. Consequently every now and then the Ministry of Commerce, Industry & Supply is faced with problems of quality control which made it feel the need for setting up a national body for the introduction of standards, on which the quality of local products can be ascertained and checked. This is, no doubt, of vital importance to the healthy growth and development of our young industry as it would enable us to secure that articles of good quality are offered to the consumer, and at the same time enable us to aim at achieving better products.

At present local manufacturers submit sample of goods to welcome Chemical Laboratories (the Government Analyst) for testing at their own expense, and obtain a certificate of

quality. The following table shows the number of samples received by the laboratories in different categories during last year :-

Waters and sewages	319
Foods	388
Drugs and Pharmaceuticals	48
Clinical specimens	30
" "	48
Toxicological specimens	183
Forensic specimens	13
Edible oils, seeds and oil cakes	925
Damaged materials	186
Building	4
Disinfectant	2
Essences	6
Gums	15
Inks	3
Insecticides	34
Methylated spirits	4
Minerals	23
Oxygen cylinders	3
Paint and polishes	6
Plastic materials	2
Soaps	35
Tobacco	2
Other samples	17
	2248

A quotation from the Government Analyst's report reads :-

"In view of the increasing volume of sub-standard articles of food and drinks exposed for sale in the market there is a tendency for amending the existing law to enable the Minister of Health to issue food

standard regulations. That is because at the moment Public Health, Police and Ministry of Commerce, Industry and Supply Authorities are reluctant, in the absence of standards, to take any legal measures to curb the sale of sub-standard foods. Many brands of tomato puree, sherry, winigar, squashes, tea, flour, milk powders, processed cheese are much below the normal quality standards accepted in other countries and even in their countries of ~~other countries and~~ origin. This is a part from the inadequate packing and mis-leading labelling and publicity. It is hoped that such amendment to the law, and the progressive introduction of food standards and regulations will offer adequate protection to the public and regulate, direct and supervise the conditions of preparation and sale of food in the country".

However all Government orders are now obtained through tenders which are open for both local and foreign manufacturers on the basis of definite specifications (in most cases these are British specifications and standards: and some-times with little modifications to suit local conditions); and in these orders an offer submitted by a local manufacturer is not given any preference unless it is of reasonable quality and price.

The object of the Government is to encourage the establishment, locally of industries which would produce high quality products, and thus ultimately cut down imports. Under its existing terms of reference, The Industrial Advisory Committee which considers applications for new industries in the Sudan - has no direct responsibility for quality. In most cases classification is given before the firm goes into production, and any promises in respect of quality have to be taken on trust. Applicants are asked in the questionnaire as to which specification they intend to conform, but no machinery exists to check their subsequent production, and there are no legal means of enforcement.

However it is not in the country's interest to encourage the manufacture of inferior quality. Hence it has been decided that a certain body should be set up at this stage of development to introduce standards to control quality in manufacture, as a factor of prime importance for maintenance of a good standard of living and for success in competitive trading.

Recently Professor C.A. Geneva, Divisional Chief Technical Officer of the British Standards Institution visited the Sudan at the request of the Sudanese Ministry of Commerce, Industry and Supply. During his seven days stay in Khartoum he visited a number of factories in various stages of development. He also visited :

1) A vocational training centre where workers for the plumbing industry and for light diesel engine repairs and maintenance are being instructed.
2) The Khartoum Technical Institute.
3) The Faculty of Engineering of Khartoum University
4) The Faculty of Agriculture and its Research Centre.

On the light of these visits, together with the discussions he made with the Authorities of the Ministry of Commerce, Industry and Supply, Professor Geneva prepared a report on standardization in Sudanese Industry. The following recommendations are quoted from that report :-

1) "Appoint a small panel of experts partly for their technical qualifications and partly for their sound knowledge of the conditions under which imported goods and materials are used. Climatic conditions are important. Variations in temperature, humidity, wind, dust storms etc at all seasons as they very much effect corrosion, wear and tear, and durability.

2) This panel, which would later develop into the Official Sudanese Institution for Standaridization - S.I.S. - should, as a first step, obtain the official standards applying to certain imported products, and should study, at home and through short missions to the factories of the countries of origin, the possibilities of improvement or simplification to suit local requirements and conditions, tentative specification should be kept under constant review during their application;

3) Arrangements should be made where necessary to test imported or locally made articles for compliance with the specified standards.

4) It is important to realize that standardization procedure is not the same in all industrial countries. In the Republic of the Sudan, the pattern to lows is undoubtedly that of a central office responsible for <u>all</u> standardization.

5) During the transitional period, about one year, there should be no attempt at compulsion for adoption of the preliminary standards, except in certain fields likely to affect safety or health, or to involve bodily risks when this can be imposed by law or Ministrial Orders.

6) When standardization panel becomes stabilized in its functions, application should be made for employment as a member body of the International Organization for standardization - the ISO. Experience acquired in the working of ISO technical Committees is of the greatest value in prepering National Standards as standardization expends.

7) A well stocked library of national standards, covering at least the industries, existing or planned, should be established for the use of the standardization office.

Conclusion:

The Government of the Republic of the Sudan, being aware of the effectiveness of standardization as a means of increasing productivity and reducing unit production cost while at the same time maintaining and advancing level of quality, has already included the establishment of this institution in the next ~~seven~~ ten years Development Budget. A series of studies are now being made to set up an Industrial Research Institute, the task of which will be to carry out research work and tests in the fields of national science and technology for development of Sudanese Industry and agriculture; this Institute shall have various Department such as :-

a) Department of testing materials.
b) Chemistry Laboratory.
c) Department of Economics and Management Science
d) Central Workshop, etc ...

The Standard Institution would either be a part of the Industrial Research Institute or as a separate institution.

1720 E - Nov.1962 - 1,600

E/CONF.39/D/179
SUMMARY
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SPECIFICATIONS AND STANDARDS

By Osman AHMED TAMAN,
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Ministry of Commerce,
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SPECIFICATIONS AND STANDARDS

by

Osman Ahmed Taman, Inspector
Ministry of Commerce, Industry and Supply

SUMMARY

A fair number of industries has been established in the Sudan, and has started to supply the local market with various types of goods such as : Building Materials, Pharmaceuticals, Paints, Toilet and Cosmetic Preparations, Laundry and Toilet Soap, Laundry Blue, Perfumeries, Matches, Batteries, Cigarettes and Tobacco, Flour Milling, Macaroni and Vermacelli, Canned Foods, Alcohols and Alcoholic Liquers, Beer, Confectionery, Biscuits, Refrigeration Units, Aluminiumware, Glassware, Plasticware, Enamelware, Wire Nails, Steel Furnature, Edible Oils, Tanning of Leather, Footwear, Textile, Paper and Paperboard Mills.

Most of these industries at present depend on a high preportion of imported raw materials. Many of the Local Products are often not of the same quality as the similar imported articles, due to obvious reasons such as shortage of technicians and skilled labour, lack of means by which the various stages of production are checked etc.

At present local manufacturers submit samples of goods to Welcome Chemical Laboratories (The Government Analyst) for testing at their own expense, and obtain a certificate of quality. There is no local institution which has the equipment and staff to render service to local industry as regards improvement of methods of processing. Consequently, every now and then the Ministry of Commerce, Industry & Supply is faced with problems of quality control.

However all Government orders are now obtained through tenders, which are open for both local and foreign manufacturers on the basis of definite specifications (in most cases these are British Specifications and Standards and some-times with little modifications to suit local conditions).

The object of the Government is to encourage the establishment, locally, of industries which would produce high quality product, and thus ultimately cut down imports. However it is not in interest of the country to encourage the manufacture of inferior quality. Hence we felt that the

need for setting up a national body to render technical service to our infant industry.

Measures have been taken to establish an industrial research institute in the next ten years Development Budget. This institute will have the task of carrying research work and tests in the fields of national science and technoloby for development of Sudanese industry and agriculture.

There are various local raw materials which would provide a good field for research, and also the institute would also give assistance to local industries as regards improvement of methods of processing.

S - 1720 E - Nov.1962 - 1,600

E/CONF.39/D/180
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Sudan

MODERNIZATION OF SMALL SCALE INDUSTRY IN SUDAN

By El Tahir Ahmed EL SHEIKH,
Assistant Inspector,
Industrial Section,
Ministry of Commerce,
Industry and Supply

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Modernisation of Small Scale Industry in Sudan.

by El Tahir Ahmed El Sheikh,
Assistant Inspector, Industrial Section,
Ministry of Commerce, Industry & Supply.

History:

Throughout the history of the Sudan cottage industries covered a wide range of beneficial objects as the traditional artistry and handicrafts handed down from centuries past as produced by craftsmen. Among these are the primitive practices of producing carpets and mats, baskets, cotton cloth, primitive tanneries leather manufacture, carpentary, boat-building, pottery, stone carving, embroidery and extremely beautiful works of ivory and wood and all the other types of handicrafts. All these industries show their originality which appears in their beautiful design, which however still calls for further improvement and modernization.

Other important small industries such as glassware, soap, vegetable oils, cement have started on a very small scale in the Sudan during and after World War II. But when the country became independent in 1956 the National Government felt that Industrialisation was of great importance for the creation of a sound and balanced economy. For this reason the Government of the Sudan after being sure of the fact that the raw materials of many industries are available locally declared its policy towards the encouragement of local and foreign capital investment in industry. The Approved Enterprises (Concessions) Act was made in 1956 and an Industrial Advisory Committee was set up so as to assess the facilities to be extended to applicants intended to establish new industry. An Approved Enterprises must fulfil certain requirements and they must contribute to the welfare of the country.

So since 1956 more than 200 enterprises have been classified as Approved Industries. A significant feature of progress during the last five years has been the increased rate of development. More and more interest is being shown in industrial development both by local and foreign capitals. Also this is due to the new awareness of industrial possibilities of the Sudan. Manufacturing establishments in the Private Sector according to the last Census of 1962 is shown as follows :-

AN ALL SUDAN ANALYSIS OF KNOWN MANUFACTURING ESTABLISHMENTS IN THE PRIVATE SECTOR ONLY, GROUPED ACCORDING TO THEIR ECONOMIC ACTIVITY AND SHOWING THE HIGHEST NUMBER OF PERSONS REPORTED AS EMPLOYED IN EACH GROUP AT ANY ONE TIME DURING 1961

(PREPARED FROM RETURN RECEIVED UP TO 15TH MARCH)

Code No.	Major Industrial Group	Total No. of establishments	Total Employers	Percent of employmentation on each manufacturing group
20	Food manuf. industries except services	103	2,626	(22.25)
21	Beverage industries	9	966	(8.20)
22	Tobacco manufacture	3	291	(2.47)
23	Manufacturers of textiles	8	503	(4.26)
24	Manufacture of footwear, other than wearing appearal, made-up textile goods	35	807	(6.84)
26	Manufacture of furniture and fixtures	30	424	(3.59)
27	Manufacture of paper & paper products	6	336	(2.85)
28	Printing publishing and allied industries	21	501	(4.25)
29	Manufacture of leather and leather products except footwear and wearing	8	80	(0.76)
30)	Manufacture of rubber products	2	25	(0.21)
31	Manufacture of chemicals and chemicals products	16	1,724	(14.61)
33	Manufacture of non-metallic mineral products except petrol and coal	11	905	(7.67)
35	Manufacture of metal products except machinery and transport equipment	33	1,092	(9.26)
36	Manufacture of machinery except electrical machinery	9	287	(2.43)
37	Manufacture of electrical machinery apparatus, appliances and supplies	16	245	(2.08)
38	Manufacture and repair of transport equipment	55	897	(7.60)
39	Miscellaneous manufacturing industries	19	78	(0.66)
	All manufacturing group	384	11,797	(100%)

Note: Only 3 of the major manufacturing groups included in the International Classification are absent in this analysis. They are major group 25, manufactures of wools and cork except furniture, 32 manufactures of petroleum and coal products and 34; basis metal industries. These either do not exist or have not been located so far.

2. The Role of Small Scale Industry

Small scale industries in the Sudan and nearly in any other under-developed country are of vital importance to any development and progress of the country. Their importance lies in giving employment opportunities to large manual power, raising the standard of living and creating a balanced economy of the country by preserving foreign exchange and processing local raw materials as well as maintaining an element of skill within the country. They also help in preserving traditional arts and skill which represent a precious part of the nation cultural heritage. Small scale industries also form a stepping stone to large industries and they offer excellent facilities for management, training and technical skills.

Problems of the Small Scale Industries in the Sudan

The problems of small scale in the Sudan are many and varied because these small industries are still under developed due to the absence of research of design and for improving the products. All the problems of small scale industries cannot be dealt with at once, so it is necessary to concentrate in selected groups of industries in accordance with national priority needs.

Many of these small industries are unable to solve their problems and they are looking forward for the help of the Government. The major problems are :-

a) Raw materials and Spares:

Raw materials for many industries are available in the Sudan. But some of these materials which are available are not primarily processed so as to meet the needs of the local industries i.e. lime enters in the manufacture of paints, and it is found in the Sudan in large quantities, but as it is not primarily processed and purified it cannot be utilised in the manufacture of paints. Also the Sudan is self-sufficient in the raw materials of textiles industry, and more than 75% of raw material used in glass are obtained locally i.e. both quartz and sand. But still most of small industries are facing the difficulties in procuring the right type of raw materials. Shortage of imported raw materials is also one of the greatest handicaps. So many of these small industries are not running at their full capacity of production owing to the shortage of raw materials or to the delay due to transportation. Spare parts also cannot easily be obtained or when imported will also be delayed due to distance and other factors.

b) Technical Know-how:

The Sudan also as one of these many under-developed countries lacks the facilities of offering technical advice on the spot. Most of small industries lack adequate knowledge of modern industrial technique and so many industries are making use of foreign technicians. The actual result of this lack of technical know-how is the rise in the cost of production because in the absence of this proper guidance small scale industries are working uneconomically as the improvement of the technique will increase the quality of the work and hence increased cost of production.

c) Lack of Credit Facilities:

Small scale industries find great difficulties in obtaining loans since there is no sufficient guarantee or security for the loan. The new Industrial Bank of the Sudan may solve this problem to some extent, by giving loans to some of the existing small scale industries but still ordinary banking organs are shy of rendering financial aid to small industries in view of the risks involved.

d) Weakness of methods of marketing:

Small scale industries in the Sudan are at a disadvantage in marketing their products. They lack the holding power because they are to a great extent at the mercy of the middle-men. For this reason the consumer obtains the products at comparatively higher prices, while the middle-men have a wide margin. There is a little knowledge of advertising methods and in spite of that there is a good chance for some of them due to the strong demand in the market. So intensive research must be done to solve the problem of marketing and specially to lessen the holding power of the middle-men as much as possible. Limited marketing facilities often act as a restriction on growth of production and income, and large scale output without marketing means will result in spoilage, deterioration of quality and might result in interruption of production process itself.

e) Lack of Standardization:

Low quality of products and lack of uniformity seriously retard the sale of small industry products, because for many goods definite standards of quality have been agreed upon.

In fact industry was shifted from the shop of a lone - black - smith to relatively big factories where need for the accuracy and unification of measures is much greater - samples of consumer products may differ in quality and quantity and

consequently their sales rate depends on those two factors which show their standard. Therefore we feel the need for setting standard specifications on which the quality of local products can be ascertained and checked. This is, no doubt, of vital importance to the healthy growth and development of our young industries, as it would enable us to secure that good qualities are offered to the consumer and at the same time enable us to aim at achieving better products.

Measures for Improvement and Modernization of small scale Industries in the Sudan:

a) Provision of good raw materials and the use of the best raw materials as much as possible is one of the basic factors for improvement of our small industries. The local resources of raw materials must be improved while the local processing of local raw materials must be encouraged also so as to meet the needs of the secondary industries. But still sometimes instead of being solely dependent upon local materials, it is advisable to find one of the measures to combine local with as many materials as could be necessary from outside as possible.

b) Establishment of Research Institute and Research Centres to improve the Technical Know-how :-

Industrial development must be preceded by careful and extensive laboratory and techno-economic research. The feasibility of basing a new industry on existing local resources must be proven. Also the method of processing of the existing industries must be improved, so measures have been taken to invite capable technicians and experts from advanced nations to provide the factories of each industrial field with the necessary guidance and to make investigations onthe local raw materials and on the improvement of the finishing process. Moreover in order to help this problem the number of Sudanese sent for specialised training abroad has been increased largely; and at the same time a vocational training centre has been established to help in obtaining skilled labour. In addition to that the Government has set up productivity centre to train the management and staff in the principles and practices of productivity under the supervision of two experts from the International Labour Office. The role of Khartoum Technical Institute and the allied branches in this field cannot be denied. The function of the technical schools and the Khartoum Technical Institute is to train technicians. The policy planning for technical education is to certain extent based on the correlation between education and the future needs of the country to make available the required number of experienced and knowledgeable

personnel to take part in the development shhemes, particularly the technical ones. The institute comprises the three main schools of Engineering, Commerce and Fine Applied Art. Extensive and well equipped workshops and laboratories are provided. In the Engineering Section students study construction, civil, mechanical, electrical and automobile engineering. Also a Senior Trade School was opened in 1960 where graduates of Post Intermediate Trade Schools take a two years course and then sit for the final City and Guilde of London Certificate. In this Senior Trade Schools various crafts are studied of which are plumbing, Building, machine shop Engineering, Automobile Engineering, Electrical Installation and foundry. Within Khartoum Technical Institute there would be teacher training centre to improve the standard of instruction in the Technical Schools in the Sudan. This will no doubt afford the students of learning better methods that would help to improve the skills and productivity on being attached to various concerns. The product of Senior Trade Schools will not only serve Government Ministries but will also be available for the private sector. Every effort is being made to establish a two-way relationship between training in Khartoum Technical Institute and the industrial concerns in the country. Such a relationship will not only bring those concerned with technical education in contact with industrialists and hence affording them the chance to assess their needs but it will at the same time keep the trainers informed of the rapid advances in production methods that come in force from time to time. This will no doubt enable those concerned with technical education to provide the industries with people whose services will yield profits with the minimum of training within the industry. To acquaint students with the conditions they are going to face on leaving the schools, summer training programmes are being arranged for them to get them to face as many life problems as they can, that will no doubt meet them in their future career. Khartoum Technical Institute is not all for mechanical training, the basic manual skills are being also provided to enable students to produce where machinery might not be available. So the Khartoum Technical Institute and its branches will help greatly in the development of small scale industries of the Sudan by providing skilled workers with knowledge of modern techniques.

Further still research centres and research institute must be established. These will provide advisory service and demonstration, on technical processes, use and improvement of equipments, training in business, management and skilled labour, research on the use and availability of local raw materials and also to make the survey of industrial prospects. These research centres

will also assist in training rural industrial staff. The Research Institute can help to attract financing, since it would be available to carry out feasibility studies and investigations on the technical and economic potentialities for interested local and foreign investors.

The proposed Industrial Research Institute which will be established by the Ministry of Commerce, Industry & Supply will no doubt assist to solve this problem. This Industrial Research Institute will perform the following functions :-

i) Give advice to the existing small industries on improved technical processes and on the use of modern machinery and equipment.

ii) Make economic surveys of particular industries and recommend suitable projects, and to carry out feasibility studies and investigations on the technical and economic soundness of projects for interested local and foreign investors.

iii) Carry out research on local raw material and on improved production facilities.

c) Development and utilisation of the existing industries

In order to attain rapid development great stress must be laid upon the full utilisation of existing industries and that is by modernization and improvement of the production facilities. Full support and assistance must also be received by the traditional industries.

In the light of the above, for attaining the required rapid development of small industries many steps should be taken. The important one is that each factory should preferably be specialised for production of some particular article. As each simple machine consists of several parts, it is difficult and it is really uneconomical to manufacture many articles in a single small plant, because it is inefficient to manufacture many products in addition to the main major products except in few possible cases. The complementary relationship between large and small industries must be strengthened whenever possible. Stress must be placed on making common production plans where both large and small industries will make their contribution with each other.

d) Encouragement of Marketing:

Emphasis must be placed upon the Internal markets demands and further still attention must be given to the promotion of exports. Intensive research for potentialities of both local and foreign markets must be done, covering all the important items

of consumers preference, prices etc etc. The main problem facing the Sudanese local market is that the consumer still has no confidence in the local brand and tends to prefer foreign products, so it is important to have a good finishing for local products to attract the consumer. Also producers have to make enough advetisement, wherever and whenever possible. The creation of consumer's preference by means of advertising is a long term business and for advertisement to be successful, it must be continuous and prolonged.

e) Construction of Repair Workshops:

Every factory must have a repair shop on the spot if possible, for repair workshops can easily be run on small or large scales, as they will enable various small industries to perform their work properly without stopping or waiting for a small repair piece to come from abroad, or suffer from delay due to railways. It also saves other industries from storing many repair parts. In fact some of the existing industries have started to have their repair shops attached to the factories; of these is Khartoum North Glassworks Factory.

It is obvious from what we have previously mentioned that the Government is responsible to look after small scale industries by taking all measures which will lead to their quick development and promotion, in order to :-

i) Raise the productivity of agriculture
ii) Provide employment opportunities
iii) Improve living conditions
iv) Utilise the local raw materials and other available resources of the country.
v) Promote production for export
vi) Spread the economic activities over a larger area through diffusion by promoting small industries in rural areas.

The products should be inspected by the Government for their quality and standard, because the market is used to receiving foreign made articles for a very long period and it is very difficult to accept a new brand locally made unless it is of an adequate high quality.

Governmental subsidy must be given to those industries which can manufacture export articles from domestic raw materials namely, textiles, carpets, leather products and ivory and ebony works. Preference must also be given for industries which are manufacturing articles from domestic and some imported raw materials to be used for domestic purposes. Proper safeguards will need to

be taken for private industrialists must be given adequate financial assistance to construct factories according to their own design if approved. Also modern equipments and technical assistance must be accepted from the experienced and industrialized countries. This will make the processing in small industries also be kept in line with the rapid improvement which are being made in the field of technology.

Importance of Co-operation

Amongst the many handicaps that small industries are suffering in the Sudan is the lack of co-operation. Many of them have an individualistic nature which create great difficulties for the promotion and modernization of small industries. So it is more desirable to form some sort of associations or industrial co-operatives according to the needs of a particular industry. Thus the encouragement of this co-operative association will being the industrialists in line with the modern demand of marketing of their goods by maintenance of high standards of workmanship which results also in raising the quality and standard of products and consequently increasing income. Industrial co-operatives will also assist the industrialists in obtaining loans and removing the middle-men from the scene. A particularly valuable service rendered by the associations is keeping their memberships aware of the important issues and economic changes that should or should not be favoured if an organisation is to be kept strong.

In conclusion it is clear that small scale industries are vital to the progress of the country because they extend employment opportunities, raise incomes and the standard of living of the people and help to create a sound balanced economy of the country. Thus they have to be modernized and organized and well looked by the Government in order to florish and play their full part in the development of the country.

THE REPUBLIC OF THE SUDAN
MINISTRY OF COMMERCE, INDUSTRY & SUPPLY

1723 E - Nov. 1962 - 1,600

E/CONF.39/D/180
SUMMARY
12 Nov.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: D.2.3

Sudan

MODERNIZATION OF SMALL SCALE INDUSTRY IN SUDAN

By El Tahir Ahmed El SHEIKH,
Assistant Inspector,
Industrial Section,
Ministry of Commerce,
Industry and Supply

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Modernization of Small Scale Industry in Sudan

by/ El Tahir Ahmed El Sheikh,
Assistant Inspector,
Industrial Section,
Ministry of Commerce,
Industry & Supply)

SUMMARY

History: throughout history of Sudan cottage industries covered a wide range of benificial objects as the traditional artistry and handicrafts handed down from centuries past as produced by craftsmen. All these industries show their originality which appear in their beautiful design.

Later in 1956 the Government of the Sudan after being sure of the presence of raw materials of many industries declared its policy towards the encouragement of local and foreign capital investment in industry, by publishing the Approved Enterprises Act 1956. So since 1956 more than 200 enterprises have been classified as Approved Industries.

The Role of Small Scale Industries

Small scale industries in the Sudan and nearly in any other under-developed country are of vital importance to any development of the country. Their importance lies in giving employment opportunities to large manual power, raising the standard of living and creating a balanced economy of the country by preserving foreign exchange and processing local raw materials as well as maintaining an element of skill within the country. They also help in preservation of traditional arts and skills which represent a precious part of the nation ~~nature~~ cultural heritage.

Problems of Small Scale Industries in the Sudan

The problems of small scale industries in the Sudan are many and varied because these small industries are still under developed due to absence of research of design and of improving the products. The major problems of small scale industries is the availability of raw

materials and spares, as many of the raw materials if found locally are not primarily processed so as to meet the needs of the local industries. Other industries are facing the difficulties in procuring the right type of raw material. Spare parts of the factory machines cannot also be obtained easily. Another problem is also the shortage of the technical labour together with the lack of credit facilities. Also the lack of standardization of product is another problem facing the small industries in the Sudan.

Measures for Improvement and Modernization of Small Scale Industries in the Sudan

The important method is the provision of good raw materials, as well as making the best of the local raw materials so as to meet the needs of some industries. Measures have also to be taken to invite capable technician to instruct and guide local technicians. Also in order to solve the problem some of the Sudanese are sent abroad to receive further training. In addition the Government has established productivity centre under the supervision of two Experts from the International Labour Office. Also the role of the Khartoum Technical Institute and allied branches in this field cannot be denied, because its main function is to train technicians. Further still a Research Institute is to be established in the near future to solve industries problems. Also it is more desirable to form some sort of cooperation between the different small industries according to their needs. Thus the encouragement of this co-operative association will bring the industrialists in line with modern requirements of the market.

S - 1723 E - Nov.1962 - 1,600

E/CONF.39/D/181
12 Nov.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: D.5.1

Sudan

PULP AND PAPER

By Faroug EL TAYEB EL HADI,
Assistant Inspector,
Ministry of Commerce,
Industry and Supply

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No. 2218
D.5.1

PULP AND PAPER

by

Faroug El Tayeb El Hadi, Assistant Inspector
Ministry of Commerce, Industry and Supply

Paper is one of the cornor-stones of civilization. It is required for dissemination of news, for the transfer of knowledge and for the preservation of history and experience in all forms of life. Cellulose may be regarded as the fibrous skeleton on which a sheet of paper is built. The raw material to be used will be determined from economic considerations as its technical suitability and also its availability in the country. The determining factors are an ample supply, available throughout the year, which will not deteriorate in storage. The field and quality of cellulose must be satisfactory, and the costs of conveying the material to the pulp mill, the processing costs, and the transport costs of conveying the finished products to the market are also paramount importance. When all these items are takem into consideration wood is found to be the outstanding world source of cellulose fibres, accounting for about 90% of world consumption. Straw, esparto grass, rags, bagasse and similar materials are however, used in considerable quantities, where they are found to be economically favourable. Other raw materials such as sulphur, limestone, rosin, alum, soda ash, salt cake and clay may be used in the industry according to the process.

The importance of paper to the economy of the Sudan can be seen by reference to the import figures given below:-

I T E M	1958 K.G.	1959 K.G.	1960 K.G.	1st 10 months of 1961 - K.G.
Newsprint paper	615,465	947,390	651,600	869,000
Wrapping & Packing	1,788,184	1,917,503	2,288,400	2,809,000
Printing Paper	501,746	818,521	448,800	926,000
Paper bags and containers	838,230	921,573	1,522,800	4,798,000
Writing Paper	890,750	1,262,598	1,411,000	1,390,000
Other Manufacture of Paper	4,151,000	5,337,000	3,582,000	3,688,000
Other Items			1,099,200	850,000
T O T A L	8,745,375	10,804,585	11,003,800	15,330,000

From this table we can see that there is a considerable increase every year in the total consumption of different types of paper. So investigations are made and a number of suitable raw materials have been found available in the Sudan, the most important ones are:-

Papyrus, Bagasse, Cotton Stalks, Esparto Grass, Sudanese Grass and Bamboo.

Papyrus

The Sudd region of the Sudan would appear to be one of the greatest unexploited sources of cellulose raw materials in the world. There is a dense area of papyrus growth of some 150 million tons covering an area of about 5,000 square miles and yielding approximately 45 tons to the acre. Furthermore since the plant grows to full height in just over 3 months, there is a possibility of 3 crops per year.

As long ago as 1910 (and again 1930) samples of papyrus were sent to the Imperial Institute, London, for experiments to show its value as a paper making material in comparison with esparto grass. The results obtained are recorded in the Bulletin of the Imperial Institute Vol.X-1912 as follows :-

" Papyrus from the Sudan and the East African Protectorate".

The sample of papyrus from the Sudan was stated to have been obtained from the mouth of the Bahr-el-Gabel. It consisted of five bundles of cut reeds, some of which were rather mouldy. That from the East Africa Protectorate. consisted of reeds varying in length from 6½ to 8 feet. The reeds had the characteristic appearance of papyrus, but were older, larger, and darker in colour than those from the Sudan.

The results of examination of the two samples are given in the following table, together with the corresponding figures for Algerian esparto grass :-

	Papyrus from East Africa	Papyrus from the Sudan.	Esparto grass from Iran Algeria
	Per cent	per cent	per cent
Moisture in material as received (on drying at 100° to 110° C)	16.3	13.8	8.8
Ash, calculated on the dried material	8.6	6.9	3.0
Unbleached pulp (dried at 100° to 110° C)= calculated on material as received	26.3	29.4	29.5
Calculated on dried material	31.4	34.2	32.3
Loss in weight of pulp on bleaching	2.3	2.9	1.3
Bleached pulp (calculated on dried material) ..	30.7	33.1	32.0
Length of ultimate fibres	From 0.01 to 0.14 in; average 0.052 in.	From 0.014 to 0.14 in: average 0.052 in	From 0.019 to 0.12 in; average 0.045 in.

It will be seen that the yield of pulp from the East African papyrus was slightly less than that from the Sudan Sample. The pulp was, however, of similar character and quality. Compared with esparto grass which was treated in the same way, the East African papyrus gives approximately the same proportion of pulp, but yields more ash, and the pulp loses more in weight on bleaching.

The papyrus from the Sudan had apparently lost about 74.0 percent of its original weight by the evaporation of moisture during transmit, and the material received at the Imperial Institute still contained 13.8 percent of moisture. It appears therefore, that the moisture in the fresh papyrus amounted to about 77.6 percent.

Paper-making trials were carried out with the two samples of papyrus at the Imperial Institute and the results showed that the manufactures of fairly good paper from this material is possible.

Later in the years 1930-33, bulk samples were tried out by two leading paper manufacturers in the United Kingdom using their standard processing plant. Both firms reported favourably

on ~~the~~ its suitability for high printing and writing paper.

Many enquiries followed up to 1939. These were concerned with the possible export to the United Kingdom of papyrus in the form of reeds in bales form and alternatively as paper pulp. Generally these enquiries broke down, not for technical reasons, but because manufacturers were already making paper from esparto grass, with machines designed for that particular purposes, and at a price with which papyrus, with its long haul from the upper reaches of the Nile, could show no advantage. It was never questioned that papyrus could not produce a paper of quality equal to, if not better than esparto grass.

Immediately after the war interest revived and uses for papyrus other than paper were discussed from time to time. Chief among these were as a fuel, for fibre board manufacture and as a course of chemicals (e.g. alpha cellulose). These again failed to produce anything tangible for economic rather than technical reasons.

The problems are largely ones of collections, transport and because of the relatively high costs, export opinion concluded that the only economic method was conversion into pulp on the spot,

In 1952, Mr. Howard, of Howard & Acrmis, Engineers, Bedford, England (who had designed machines for cutting swamp grasses in Uganda and Nyasland) interested himself in the collection problem. No produced a specification and drawing for a machine with the title "Sudd Cutting and Harvesting Machine".

In 1955, a Swiss Group, headed by Mr. Harrich Voglger visited the papyrus area and carried out chemical analysis and processing tests on samples from the district. Their conclusion was that a very satisfactory quality of cellulose and subsequently of paper, can be produced from papyrus. Other chemical raw material e.g. limestone are fortunately available in the Sudan and little would need to be imported.

During the years 1956-59, many enquiries and investigations were carried by various firms. Among these was a group of German firms who submitted an application to establish a paper factory in the Sudan. They projected to produce 8000 tons of all types of paper to meet the country's requirements. Estimated capital cost for all the project, including the papyrus collecting and transporting system, was LS.4 millions. The group was given approval in principal but again they failed to raise the necessary capital.

In the same year serious investigations were started by two local concerns i.e. the Arabian Company for Paper Manufacturing and Two Niles Cellulose and Paper Manufacturing Co. Both firms worked in close collection with German Consultants. Two teams of German experts flew to the papyrus area and carried detailed surveys and investigations in situ. Technical and economic reports were submitted to this Ministry which indicated beyond any doubt the economic feasibility of a Paper Industry in the Sudan. Both firms were given provisional approval to realise this important industry, but nothing serious has materialised yet.

Cotton Stalks:

Cotton is by far the most important crop in the Sudan. The greatest part of the crop is cultivated in the Gezira Scheme, whose beginning on a major scale dates from 1925. The total irrigated area is now about 1,557,000 feddans.

Various attempts have been made to utilize waste cotton stalks for the production of pulp and for other industrial purposes such as the manufacture of sacking materials, building materials etc. All such attempts came to end due to the fact that the Gezira cotton type can be infected with black arm and unless the stalks are burnt the probability of an infewtation for the next seasons crop cannot be eliminated. This has to

continue for some years and for such a time that other reliable methods for combating the disease, other than by burning the stalks, are found.

However, cotton resistant to black-arm disease, is grown in other regions of the Sudan, such as Upper Nile, the Gash and Tokar Delta (Kassala Province), Equatoria, Nuba Mountains, Gedaref and some other minor places. In these areas the chances fo for utilising cotton stalks are not handicapped.

For this reason the Government constructed a card-board factory at Aroma (Gash Delta) designed to utilise waste cotton stalks.

Extensive research on the utilisation of Gezira cotton stalks has been carried out by the Sudan Gezira Board, Barakat and Agricultural Research Division, Ministry of Agriculture.

Bagasse:

The Sudanese Government constructed a sugar factory in Blue Nile Province at (El Guneid). The accruing bagasse is to be used as fuel purposes. The quantity of sugar cane to be processed per day has been set at 4,000 tons. During the first year of operation production is to continue for a period of two months which would be equivalent to a processing of 240,000 tons of sugar cane. The cane has a fibre content of 12% which means that 240,000 tons of cane contain 28,800 tons fibres. On deducting 25% for inherent losses, there would be left 21,000 tons absolute dry fibre. With a yield of 40% it would be possible to manufacture 8,650 tons of pulp from this fibre. This would be sufficient to cover the requirements of the paper mill.

During the second year production at the sugar factory is continued through five months with a daily processing capacity of 4,000 tons of cane. In other words an estimated total of 600,000 tons of cane are to be harvested in the second

year. The capacity of the sugar factory in due course is to be doubled.

Even though the Arabian Paper Manufacturing Corporation shows little inclimination of utilising bagasse as raw material, the problem was on account of the certain availability of substance given certain consideration. Papyrus, on the other hand, involves great problems in harvesting and transportation.

With 25% losses due to waste, dust and pith the true price per ton of bagasse absolute dry would be LS.8.35. The costs of bagasse per ton of absolute dry pulp at yield of 40% would be LS.20.80. The only factors to be added are the transportation costs to the mill.

Other raw materials:

Bamboo: Bamboo grows in abundance in the South of the country, far distant, from the papyrus area. Its utilisation, however, would probably not be profitable. There is with the papyrus a type of bamboo with a maximum height of some 4 or 5 metres, a thickness, of only that of a human thumb. Its relative growth is probably some 5% of the papyrus of the area. There may be a possibility of utilising this bamboo for the paper and pulp, manufacture.

Esparto: It is available in abundance in the South of the country and is excellently suited for certain types of coated paper.

Sisal: It is also available in wide growth in the Southern Sudan. It would be possible, to start plantation of this plant in the vicinity of the mill and would thus ensure a supply of satisfactory raw material for sulphate paper domestically

Sudanese grass.

Grows in unbelievably large quantities near to Khartoum. Its harvesting and transportation to the mill would be possible at little expense. The pulp derived from this raw material is similar to a poor quality straw pulp. It has been submitted for

testing to our central laboratories.

As a matter of fact, many companies applied for an Approved Enterprises, so as to manufacture paper in the Sudan. This is something natural as we have a lot of raw materials which show to be satisfactory in paper production and also as the demand of the country is in a noticeable increase in every year.

The table shows the companies which will manufacture paper :-

Approved Enterprises for Paper Manufacture

And Other Allied Products:

Factory	Material used	Production	Remarks
1) Government Cardboard Factory	Cotton Stalks	4000 tons of cardboard annually	will go in production shortly
2) National Paper Industries	Waste Paper	3000 tons of wrapping and packing paper annually.	" "
3) Ahmed Saeed Baashar	" "	1500 tons of wrapping paper annually.	Not in Production
4) The Two Miles Cellulose & Paper Manufacturing Co.	Papyrus	18,000 tons of paper and Cellulose annually.	" "
5) Arabian Co. for Paper Manufacture	"	10,000 tons annually paper and cellulose	" "
6) Gabir Abul Izz	Cotton Stalks	2000 tons annually of paper hardboard	" "
7) Hafiz El Barbary	Waste timber, wood shavings, etc.	1,700 tons annually	" "

1711 E - Nov.1962 - 1,600

E/CONF.39/D/181
SUMMARY
12 Nov.1962
ORIGINAL : ENGLISH

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Sudan

PULP AND PAPER

By Faroug EL TAYEB EL HADI,
Assistant Inspector,
Ministry of Commerce,
Industry and Supply

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Ministry of Commerce, Industry and Supply

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S - 1711 E - Nov.1962 - 1,600

E/CONF.39/D/182
12 Nov.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item : D

United States of America

POLICY CONSIDERATION IN EXPANDING INDUSTRIAL DEVELOPMENT

By Edward GUDEMAN,
Under Secretary of Commerce,
Department of Commerce,
Washington, D. C.

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POLICY CONSIDERATIONS IN EXPANDING INDUSTRIAL DEVELOPMENT

Edward Gudeman
Under Secretary of Commerce
Department of Commerce
Washington, D. C.

1. An increasing number of Western theorists who are concerning themselves with the problems of economic development in the less-developed countries are finding more and more social pre-conditions that must be satisfied before economic and therefore industrial development can occur. Literacy, political stability and recognized central government authority, an administrative class, an educated elite, a functioning and pervasive juridical system, are all examples of the preconditions which are being talked about.

2. Some writers are convinced that because industrialization has never been successfully carried out in a tropical country, it represents an unlikely probability even with the latest technological and financial aids. Some insist that a remarkable sociological mutation must occur before a new society can develop from older and more primitive forms; while some argue that an intensive application of modern science and technology can help to sublimate the need for this mutation. There are many more preconditions to economic development which are being discussed, and if we were to give equal weight to them all, we could come to the forlorn conclusion that social, economic, and industrial development are impractical ideals.

3. There are several observations which I want to make about this early trend in analysis: First, the process of history is going to continue regardless of theoretical or dogmatic models; and the movement to change and to modernize by the developing countries, stimulated by a growing sense of nationality, is going to proceed one way or another, but proceed it will. This, it seems to me, is inevitable.

4. Second, theoretical approaches should not be interpreted as dogma or be allowed to regress into dogma. The theoretical approaches which I have used as examples represent the recent beginnings of a welcome awareness of the need for research and analysis in this field. They should be regarded, however, as trial and error efforts to abstract common sequential occurrences as guides to development processes and policies. Systematic speculation in this field is new; and the speculators very often tend to apply available abstractions, derived from the reality of Western socio-economic development over the past several hundred years, to the concrete realities of present day unindustrialized countries. I suspect that even in highly abstract and complex mathematical formulations of growth models, input factors contain inarticulate constants reflecting normative rules of behavior characteristic of modern Western industrial society. This can lead to misapplication in approach and practice. It also can lead in the latter instance to a tendency to believe that the best practice in the U.S. or the U.K., or France or Germany is the best practice everywhere.

5. There have been, on the other hand, important historical departures from the generally accepted interpretation of the socio-economic historical sequence.

Some countries have developed without much primitive accumulation of capital, some without monetary stability, and some in the absence of public order or land reform. I personally agree with those who think that the commonly denominated historical attributes of Western development probably will not be applicable in the same degree or in the same order for these countries where a latter day industrial revolution is commencing---a revolution which is occurring within a technologically advanced framework which was undreamt of during the early phases of Western industrial development.

6. Third, all this points up the requirements for more empirical data and more intensive research about the development process not only by industrialized countries but, more importantly, by the developing societies themselves.

7. Innovation and experiment in both theory and practice are needed. When theory and practice collide, new theories will need to be discovered. Our present knowledge, for example, is deficient about the human and institutional resource problems of developing countries; about the ways in which technical assistance can contribute most effectively to growth and change; about the ways in which scientific and technological knowledge can be adapted to the unique needs of nearly a hundred countries; and about the possibilities of new or inverted sequences in the development process.

8. In my view, the most important conceptual starting point for economic and industrial development is the national development plan and a systematic approach to its implementation.

9. When we speak of a less developed country, we are not really clear about what we mean beyond a generalization that it is a country which did not until recently develop a national motiviation to industrialize, and, based on rough estimates, that it is a country which, to the disadvantage of its individual citizens, suffers from a comparatively low per capita income. In most cases our definition must stop at this point since beyond it we encounter all manner of diversities of historical, ethnic, cultural, and institutional factors. The national plan is the most useful device available to take account of these unique characteristics. At the same time it provides the basis of a coherent effort to accelerate the development process through the establishment of comprehensive goals, the choice of specific objectives, the allocation of resources commanded by the government, and the establishment of correlative guidelines and incentives for the private sector. The planning effort not only sorts out development possibilities and limitations in quantitative terms but also reveals the gaps in essential data. Through its implementation, and its correction and refinement through experience, systematic planning also can highlight the economic processes which require more research and analysis, particularly where deviations from historical Western norms need to be made.

10. The national plan has a very important collateral function. It provides an important guide to the amount, type and timing of recurrent external assistance requirements. Rapid industrial development combined with reasonable political and economic stability presents extremely complex problems for public policy-makers, especially in countries where the rate of saving is barely reflected in institutional capabilities, and the advantageous effect of saving is offset by a growth of population which exceeds that of national income. It is obvious that developing countries must supplement their savings with resources supplied from the outside. The only alternatives are the abandonment of the democratic ideal, social regression and possibly chaos, or the introduction of compulsion and force for a long time to come at all levels of the social structure.

11. While it is not hard to see that "substantial" outside assistance is needed for investment, consumption, and manpower training needs, it is not easy to determine the magnitude, the types, or the timing of requirements. The West has barely begun to think in terms of an integrated approach to the provision of assistance. More

attention has been given thus far to the amounts now being supplied, and what more could be supplied than to the problem of a rational determination of requirements and agreement about supplier responsibility. And here, I must point out that it is not easy to organize an integrated Western capital assistance and training effort. The demand for capital is increasing in developed nations because of new technologies, defense requirements, a rapid growth in population, and, most importantly, increased consumption due to income redistribution. It is a serious challenge to the Western industrialized countries therefore to move toward agreement, as a very general principle, to provide one per cent of their gross national product for external assistance, and satisfactorily to organize its provision. It is equally a challenge to the developing countries to develop requirements in concrete and progressive terms and in conformity with rational development objectives. The sometimes vague estimates on the basis of which assistance is now being provided need to be made more significant and explicit. This is not to say that assistance can or should wait upon ideal circumstances. But it does mean, it seems to me, that developing countries should set a high priority on a concurrent development of institutional capabilities which will enable them to fix quantitative targets and input requirements, on a comparable basis, by time periods much more coherently than is generally the case today. This process is not only essential for estimating what can be done, and at what rate, but a rational determination of requirements can be a useful catalyst to growing Western efforts to organize and coordinate the means to help satisfy these requirements. I would carry this reasoning a step further: It is unrealistic to expect aid suppliers continuously to provide scarce capital inputs to maximize output on a predominantly supplier estimated basis. It is also unrealistic to expect that national and international suppliers can coordinate their efforts reasonably well in the absence of organized direction from planning and implementing agencies operated by the receiver. The developing country therefore needs to create or improve institutional facilities to acquire the essential data for planning, and to improve on plans in the light of practical experience.

12. It is in this field of technical institution-building that modern training methods and new techniques of observing and analysing data can quicken the pace of national planning and estimating. I should like to stress in this case, and in the other suggestions to follow, that I do not intend the implication that well-rounded and modern data collection and analysis services must be in operation as a precondition to national planning or the development process. On the contrary, I suggest that you start the planning process with the data available; and that, while the trial and error process develops empirically, you build-up concurrently more efficient and more broadly based data collection and analysis institutions. The process of institution-building can and ought to be associated with the current planning, project analysis, and implementation process itself.

13. All planning must be based on empirical data. Comprehensive planning requires aggregate estimates of the economy, by economic sector, for past periods. Since goals can be defined only in terms of data about the country's material, financial, and manpower resources, data are needed on population, agriculture, employment, production, income, consumption, investment, savings, and international trade. A program for generating and disseminating statistical information must be centered in the Government. It is the only agency with a broad enough base to assume the responsibility for maintaining an up-to-date inventory of human and material resources.

14. The organization or improvement of a central statistical data collection and analysis agency is an essential ingredient in this effort. Its initial functions, for the planning process, are the compilation and analyses of basic statistics

through censuses; and the compilation and analyses of derived statistics, such as national income estimates.

15. There are other important areas of necessary knowledgeability about a country's resources which I will mention only briefly, since they will be developed more fully in other sessions of this Conference. But I identify them in this context not only because of their utility for national planning but because they are also fields to which I believe much greater attention should be given by both developing and industrialized countries in shaping technical assistance programs for the benefit of the former. An inventory of natural resources, including mineral, agricultural and forest resources, requires effective geodetic control and mapping. Transportation and communications planning can be developed only on the basis of a combination of accurate geodetic controls and economic planning. Maps can be designed to serve specific objectives. The accurate topographic map is the basis for special maps for industrial cadastral, geological, hydrological, irrigation, flood control, and other important planning purposes.

16. Weather and climate exert a major influence in shaping the course of economic development. Even in tropical climates where the impact of day-to-day changes are small, seasonal or long term trends have significant effects on the national economy. Industrial planning should be related to the characteristics of weather and climate and the effects which these will have on a changing economic structure. This suggests the early institutionalizing of data collection and analysis in the related fields of meteorology and hydrology.

17. While there are other important central institutional capabilities which will need to be developed for other branches of the earth sciences and in such fields as industrial standards and patents, I feel that the data requirements for planning purposes place a high priority on the census and central statistical agency, and the geodetic and meteorological services, since so many other sector plans depend upon them.

18. In these fields very considerable technological advances have been made in the last quarter century which permit accurate, correlative and rapid data accumulation and analysis. Also---and here I can speak only for the United States---we have developed effective and systematic training methods and techniques of institution-building in these fields, through many years of operation of our technical assistance programs.

19. Most newly developing countries have a shortage of foreign exchange, an inadequate rate of savings, and an insufficient supply of investment capital. Are there economic planning and implementation techniques that have proven effective in the older industrialized societies which can help the newly developing countries develop faster in the face of these shortages?

20. The answer, I believe, is clearly affirmative, provided the country adopts an operational approach to the development process. By operational I mean that goals are set, alternatives are examined to achieve these goals, choices are made, progress is reviewed objectively, and corrections made. This process, which involves a combination of national income analysis and applicable developments in industrial planning, is perhaps best described as a feedback process. It can be used at a national level and an enterprise level, by government enterprise or private enterprise. These techniques which I have in mind are basically measurement techniques and are not solutions for complex socio-political problems of development, nor are they a magic prescription to bring the development process to an arbitrary goal of economic self-sustenance. They do not depend for their operational validity upon a priori doctrine, but, on the other hand, they are not a substitute for good judgment or common sense. One of their objectives is to reduce the probability of

concrete error through an analytic trial and error process and to contribute to a rationalisation of the economic decision-making process at the national level so that you will have a better idea of where you have been, where you are, and where you are going. Another objective is to provide techniques which can, with some training, be understood and used at various operating levels in government and in the private sectors; and which can evolve in expertness through experience.

21. Effective economic development will require the synchronization of the national plan and the individual projects. Because a great deal has been written about national planning (or macro planning) I shall only sketch the essential elements of this process since I wish to suggest in more detail an approach to project (micro) planning--an area which has been given much less attention. 1/

22. The national plan must be based, in the first instance on a resources and demand analysis. This analysis should result initially from a quick survey of available natural resources, skills and facilities such as power, transportation and manufacturing. It should indicate past patterns of imports and exports and contain reasonable guesses about probable increases in demand for imports, the possibilities for increased exports, availabilities of raw material imports, and external financial assistance. These estimates, because they are quickly arrived at, will be rough and obviously susceptible to considerable margins of error. But because planning and implementation of economic development is sequential and consists of interdependent activities, the resources and demand analysis can and should be consistently refined and amplified as a result of experience with implementation. An important objective of the initial resource and demand analysis is to identify obvious opportunities for quick gains, generally involving higher production from existing resources; and to uncover major opportunities that have a longer lead time.

23. Aggregate goals and limitation of the economy over time also should be tentatively developed in a macro-economic analysis. An analysis, however preliminary and tentative, of important economic variables, such as the capital output ratio, the rate of saving, population growth, the propensity to import, are important indicators for a realistic appraisal of the national economic potential.

24. The potential, which will shift through time both qualitatively and quantitatively, can be set down initially as a tentative national plan which provides preliminary goals--goals which are as specific as feasible about the nature and timing of major project undertakings, as well as, for example, about the anticipated development of income, savings and investment. It is important to understand that the whole process represents a dynamic and interconnected flow through time periods and not a random series of static pictures. The magnitudes involved will be components of national income analysis. The past is the takeoff point for future plans. The present measurements are the guides to past achievements.

25. The de facto plan is the selected projects, the implementation of the selected projects, with the timing of implementation a critical dimension. In the context of the newly developing countries, project selection is necessarily a rationing of very scarce resources.

26. It is in the working out of the project selection and implementation process that the overall economic plan will stand or fall, and it is to this process of selection that the calculation of relative advantage must be directed as dispassionately as possible.

1/ The suggested approach to project evaluation and selection is being developed for publication by Morris J. Solomon, Chief, Operations Research Branch, Statistical Research Division, Bureau of Census, United States Department of Commerce.

27. Where there is no choice, there is no problem. Such a situation will be extremely rare. A Five- or Seven-Year Plan for a country will provide an overall framework for projects, and normally there will be a large range of alternatives for achieving the same purpose. The essence of decision-making is not only to choose among alternatives but to choose the best project viewed from different angles. We all recognise that new nations very often want to have a large hydro-electric project rather than smaller thermal projects, or want a larger rather than a smaller steel mill, or a large aluminum plant, or an automobile factory, and want a great many of these things very soon; and that there are important political pressures favoring such choices. In some instances it may be necessary to select a project which is more important in political than in economic terms. But it is important to have a measure in quantitative terms of the comparative cost, over time, between the politically motivated and the economically satisfactory project. You should analyze the comparative cost advantages of similar projects, and of inter-regional projects; and of the comparative benefits, of social and economic projects. While projects can also be chosen to satisfy criteria which are difficult to assess in quantitative terms, you can approximate the cost and rate of return of such projects and explore the feasibility of dealing with these requirements by other instruments of national policy. For example, inequality of income is often affected by the choice of projects, but this need not be the compelling motivation in shaping a project if there are other methods of helping the problem, such as tax policy, institutional reform, public works or even welfare expenditures.

28. It is possible to analyze projects so that:

(a) The central planning authorities have a basis for choosing those projects which are best from a national point of view.

(b) Technical personnel of the operating unit can use known national criteria for shaping the project so that it is most desirable considering both the national and enterprise point of view.

(c) The form of analysis facilitates implementation.

29. A method of project analysis that has the above characteristics facilitates the synchronization of the national plan and the individual projects. It also provides for the unity of planning and the implementation at the operating level. The resulting coupling of planning and implementation sets the stage for feedback at all levels of activity. The feedback cycle is completed with the measurement of results and the impact of these results on the succeeding cycle.

30. It is essential that the measurement of results be made in a spirit of genuine diagnosis rather than as a confirmation of accepted policy, doctrine, or theory.

31. While the national economic plan will assume and approximate the availability of physical and financial inputs, the demand for outputs and the general interrelationship of projects, individual project analysis generally requires a more detailed market study, a physical resources flow plan and a financial plan.

32. The physical flow plan is developed in real terms--labor, materials, land--together with estimates of the time when each tangible input and output takes place. An important element in planning is a comparison of alternative plans in order to be able to choose the most promising in terms of:

.various scales of plant
.alternative locations
.alternative time phasing
.alternative raw materials
.making or importing needed materials or commodities

Each alternative is capable of being shown as a comparable physical resources plan. While there is some appeal to making decisions on the basis of physical factors alone, any attempt to compare alternatives by this device runs into difficulty because of the purely physical non-comparability of many of the factors in each alternative. You may, for example, end up with a judgment which turns on a comparison of man-days and a ton of imports. Or a serious error in judgment may be committed in evaluating labor intensive versus capital intensive projects. This problem can be handled through the development of a financial plan and the assignment of weights (prices) to the various components. By treating the weighted values as additive it is possible to develop a uniform basis for comparison of alternative projects. The problem of what kind of weights to use, not only to produce comparable data in alternative projects, but also for other factor inputs and outputs in order to correct for differences between market prices and social values, is a complicated one, but one where recent advances in the use of "shadow" prices and linear programming can be of great help.

33. The financial plan should include the domestic investment schedule, the foreign exchange and investment schedule, and conventional profit and loss estimates. The result of these assessments will provide other important common measures for comparing projects.

34. Thus far we have outlined the form by which projects can be quantitatively described and comparatively judged. One of the most important procedural steps in analyzing a project, however, is the time phasing of its physical and financial inputs and outputs. A project that takes five years to construct before output is realized is less desirable than a comparable one which takes three years. The flow of inputs and outputs should therefore be discounted for time. Again, we believe that we have developed programming and analysis techniques which can be of considerable help in determining the rate of return of alternative opportunities.

35. The analytical guides that have utility for evaluating the individual project are the rate of return to the enterprise and the rate of return from the social point of view.

36. The return to the enterprise, whether a government enterprise or a private firm, is essentially the discount money flow used by commercial organizations.

37. The social evaluation of a project is suggested in static form by the so-called capital output ratio. While such a ratio is roughly indicative for the economy as a whole, to deal more accurately with actual project complications, a number of qualifying features need to be incorporated to produce a more realistic basis of comparison for projects. This guide, the national gross rate of return, has been developed specifically to handle some of the influential complications in real life such as:

. time phasing of input and output
. discounting for time
. treatment of depreciation as an availability
. comparison among alternatives
. avoidance of fictitious value added by adjustment for difference in prices among alternatives
. taking tax revenues into account
. use of shadow prices for resources whose market prices do not reflect their social value, particularly foreign exchange

38. An additional analytical guide which reflects economic growth even more directly than the national gross rate of return is the surplus rate of return. A characteristic of the national gross rate of return is that it counts output as a benefit regardless of who receives it and regardless of how much of the resulting income is reinvested. The surplus rate of return is the discounted rate of return of the surplus flow generated by a project which is available for reinvestment. This especially meaningful measure of economic growth provides an answer to the question: "For each unit of surplus made available to the project, at what annual rate is a flow of surplus generated?"

39. Judging alternative projects from these various aspects (enterprise, national gross rate of return and surplus rate of return) not only permits a more rational selection in terms of maximum benefit, but in the course of this analysis facilitates modification of project design to remedy flaws that are demonstrated by the analysis.

40. Each analytical guide by itself is insufficient. One can think of common situations where reliance on one alone can lead to a poor project. For example, a project is proposed to manufacture a product presently imported with a 50 per cent duty levy. The proposed project calls for a prohibition of imports. The enterprise will sell the product to the consumer at the same price as the imported product. The enterprise rate of return is excellent. But due to a loss of tariff revenues the national gross rate of return is poor as is the surplus rate of return since both are measured in relation to the existing import duty. Or a flood control and irrigation project is proposed that is estimated to produce large increases in crops and income. The national gross rate of return is good, but the surplus rate of return is poor. The reason is that benefits accrue to small cultivators who are not taxed to pay for various services. If the rate of economic development is to be accelerated, the project would need to be modified so that a larger per cent of benefits become available for reinvestment.

41. Without the measurement guide of return on investment, projects will be approved on the basis of speculation, wishful thinking or dogma rather than on the basis of tangible and measurable advantage. It is an interesting commentary on the utility of this process, that Soviet engineers in their day-to-day work have persistently shifted toward criteria which closely resemble rates of return in the comparative evaluation of plans and projects.

42. The corollary of project selection is the process of project implementation. A good plan poorly implemented will give bad results just as a poor plan well implemented will give bad results. Here again, I think that our very considerable practical experience in modern industry and in highly sophisticated government-industry engineering projects can supply valuable guidance, provided the newly developing countries creatively adapt such techniques to the special circumstances of their own environments.

43. In connection with the problem of implementation, I should like, in conclusion, to mention a number of significant concepts arising out of recent management research. First, of course, is the concept of feed-back which is relatively old, but is each day demonstrating its validity and usefulness. Second, is the relatively great effectiveness of a multi-dimensional approach to human motivation. A policy on relying on one dimension of human motivation whether it is fear, monetary rewards, prestige, rank, patriotism, professional interest, security, is far less effective than a combination of all relevant dimensions. In fact, the fundamental task of management, whatever its formal structure, is to choose an effective mix of incentives.

44. Third, a closely related concept of recent research is the notion that social and economic situations often correspond to what the mathematicians call a non-constant sum game whose characteristic is that the various participants necessarily

gain together or lose together. This view of organized human activity is sharply differentiated from the constant sum game, where some constant value is divided among a fixed number of participants, and only where one or more participants "exploit" the others can these favored individuals gain.

45. The implications of these concepts for human affairs have been scarcely realized outside the narrow confines of specialists. The multi-dimensional approach to the problem of human motivation, the non-exploitive characteristics of gain in the mathematical theory of games, the concepts of "feed-back" and the "rolling method" of program review and revision have important implications for planning, plan implementation and plan revision. More research is needed on the practical applicability of these concepts, particularly in developing countries. But it is already quite clear that implementation of projects calls for close teamwork within the framework of a non-exploitive situation, and that a broad range of incentives must be used by governments of developing countries in the face of critical shortage of skilled manpower and management personnel. In addition, it is clear that planners must assume an important responsibility for implementation. The planners, separated from implementing responsibility are subject to optimistic bias. The implementers face the concrete reality of a program and this often makes them pessimistic. The two functions are not practicably separable and their organic connection is also important in relating the "feed-back" of empirical evidence to the planning process itself.

46. Each less-developed country has its own special problems. Each country's national and cultural revitalization will be shaped by its ideals and its history, and by the impact of modern science and technology. It is clear that management of scarce resources will play a critical role in the drive toward industrialization. The creative modification of known techniques for better planning and management deserves a substantial research effort by both industrially developed and developing countries. Such an effort has a potential for discovery which can mark the difference between acceleration and retardation of the development process.

1760 E - Nov. 1962 - 1,600

E/CONF.39/D/182
SUMMARY
12 Nov. 1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: D

United States of America

POLICY CONSIDERATIONS IN EXPANDING INDUSTRIAL DEVELOPMENT

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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

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POLICY CONSIDERATIONS IN EXPANDING INDUSTRIAL DEVELOPMENT

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SUMMARY

1. During the past decade, there has been a rapid and great increase in speculation by Western social scientists about the problems of economic and industrial growth in the less developed countries. This has been reflected in a growing body of literature ranging from theoretical exploration of the various socio-economic factors in development to practical guides for industrial project design.

2. Because theoretical exploration of development is relatively new, as applied to new arrivals at the threshold of economic modernization, criteria and interpretations are very often based on commonly accepted historical sequences of Western experience. It is entirely likely, however, that new and different sequences will occur in this latter day industrial revolution if only because of the scientific and technological advantages which are available today, and which were not known during comparable stages of Western industrial development.

3. Present theoretical analysis of the problem is therefore tentative. Innovation and adaptation of theoretical and practical guides will be necessary as more relevant empirical data and research show the way for change.

4. Each developing country has unique characteristics and problems which derive from its culture and its history; and development will therefore evolve through discrete national realizations of this process.

5. Common economic denominators of less-developed countries are shortage of foreign exchange, an inadequate rate of savings, insufficient investment capital, and a relatively low per capita income. These common denominators imply, in most cases, the need for external assistance.

6. The national development plan is probably the most useful starting point for:

(a) establishing goals, and identifying possibilities of choice, based upon a rational appraisal of a country's economic potential;

(b) taking account of unique socio-economic characteristics;

(c) setting down time periods of practical attainability;

(d) exposing and remedying deficiencies in data collection and analysis;

(e) rationalizing the need for external assistance; and

(f) illuminating areas for needed research and analysis and new theoretical approaches to problems.

Modern techniques of data collection and analysis in the areas of censuses, earth sciences, et cetera; modern techniques of training and institution building; and modern techniques of national income analysis and project evaluation and selection can be extremely helpful in creating or improving national plans and their implementation.

7. Aggregate goals and limitations of the economy over time can be shown through macro-economic analysis. Methods exist for project analysis which show the relationship of a project to the national plan, and the factors which make the choice of one project economically more advantageous than the choice of another.

8. These techniques already have demonstrated their utility for Western industrialized countries. They do not depend for their effectiveness upon conformance to any impractical theory or restrictive dogma. Creative modification in their use is needed, however, for better planning and management by developing countries.

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